NASA Procedural Requirements

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COMPLIANCE IS MANDATORY

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Subject: Facility Project Requirements

Responsible Office: Facilities Engineering and Real Property Division

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Chapter 3. Design

3.1 Design Coordination

The FPM must keep the project team apprised of significant developments throughout the design phase.

3.2 Architectural-Engineering (A-E) Services

Whenever A-E services are required, the FPM and Center Procurement Office shall acquire those services in accordance with the FAR and the NASA FAR supplement.

3.3 Public Release

Public disclosure of CoF project information (including subprojects and/or work packages) shall occur only after release by the appropriate committees of Congress. Design documents prior to their planned construction fiscal year of execution are sensitive, and the FPM must ensure that all parties connected with project development are cognizant of this sensitivity. Design packages used for acquisition must not include any information classified as "for official use only," secret, or top secret. The FPM may share CoF project information once the designer or contractor is under contract but only after the Center Office of Security approves the action. Any information deemed sensitive but unclassified must be handled in accordance with NPR 1600.1, NASA Security Program Procedural Requirements.

3.4 Management of Design

It is NASA policy to award CoF projects early in the fiscal year in which it is planned. The FPM must plan and manage CoF program projects to support reaching the goal of awarding during the second quarter of the fiscal year.

3.5 Preliminary Engineering Report (PER)

The FPM shall ensure a PER is performed on any assigned CoF project having significant technical or financial risks associated with it (e.g., employing leading-edge technology, highly technical, complex, or with incremental funding). If a PER is performed for a project, the PDRI score shall be determined soon after its conclusion (see paragraph 2.2.3, Front End Planning). If a PER is required, it must include the following sections:

3.5.1 **Section I: Requirement Statement and Justification** -- Describe and justify the project requirements, problems, and milestones. Center directives will be referenced to support the requirements and required completion date.

3.5.2 **Section II: Descriptive Analysis** -- The problems and solutions identified must be explained with sufficient detail to adequately make rational decisions. Include schematics and one-line diagrams showing the functions and operations to be performed within the facility. A life-cycle cost analysis that meets the requirements of paragraph

2.2.4.12., Budget and Approval Documents, must be developed and provided for each alternative. Each alternative will include discussions on the pros, cons, risks, and analyses for meeting the project requirements including safety, fire protection, energy conservation, environmental, operations and maintenance considerations, and sustainability. Where applicable, each alternative must include information on architectural, site development, structural, mechanical, and electrical considerations; real estate actions; and any affected utilities. Real estate requirements, including acquisitions and easements, will be addressed in this section; Section III, Engineering, Budget, and Other Estimates; and a dedicated appendix (see paragraph 3.5.5.2, Real Estate Interest, below). If there are no real estate requirements, it must be clearly stated in this section.

3.5.3 **Section III: Engineering, Budget, and Other Estimates** -- The PER cost estimates will be prepared on NASA Form 1510, Facility Project Cost Estimate, in accordance with Appendix C, Forms and Instructions. The cost estimating process includes Engineering Estimates (EE), budget estimates, and other cost estimates.

3.5.3.1 **The Engineering Estimate (EE)** -- This represents the CoF costs developed from the draft project documents (drawings and specifications) prepared for the PER. The estimate includes the costs for materials, labor, real estate actions, and services, including contractor overhead and profit. Adequate design contingencies must be included. The EE must include all labor and material costs for all items including collateral equipment that would normally be furnished by a contractor and installed as permanent in the facility (see Appendix D, Facility and Other Related Costs, for a listing of items and types to include). When applicable, the cost to install Government Furnished Property (GFP) will be included. The EE must not include escalation, construction contingencies, or Supervision, Inspection, and Engineering Services (SIES). The basis or source used will be indicated on the estimate. Estimates will identify funding requirements by fiscal year(s) and amount(s). The EE must include unit costs (e.g., units of measure and quantities for each significant item) instead of lump sum estimates whenever feasible. The EE is the estimate used for comparing alternatives within the PER.

3.5.3.2 **Operations and Maintenance (O&M) Cost Estimate** -- An O&M cost estimate covering the expected life of the facility must be included for each feasible alternative in the PER. This cost estimate will include estimated energy and maintenance costs for installed systems over the expected life of the facility.

3.5.3.3 **The Budget Estimate** -- This estimate includes the EE of the selected alternative, escalation, construction contingencies, commissioning services, and SIES. This estimate will follow the same guidelines for unit costs as outlined in the prior paragraph. The total budget estimate becomes the budget amount (BA) after it has been submitted to OMB and is the BA for this project on all future reports to HQ (see paragraph 1.3.17, Program Reporting Requirements).

3.5.3.4 **Other Cost Estimate** -- Project requirement costs not covered in the prior two paragraphs should be included within the PER, but annotated separately. For example, non-real property equipment, furniture, and telecommunications equipment required to meet the project goals and objectives fit under this heading.

3.5.4 **Section IV: Design and Construction Schedule** -- Provide a project schedule using a commercially available project planning software and identify the software in the PER. If a predetermined need date has been established for the facility, it shall be shown in the schedule. The schedule must address requirements for other Architectural-Engineer (A E) services, long lead items, special approvals, and other special requirements. If more than one construction contract is contemplated, an estimate of the time required for each major contract and the phasing will be provided. The schedule must include the estimated number of months required for each of the following:

a. Preparing the final design documents.

b. Construction acquisition.

c. Construction.

d. Facility activation.

3.5.5 Section V: Appendices to the Report

3.5.5.1 **Drawings** -- As required for clearly illustrating the project, drawings for the PER will include a location plan, site plan, single-line floor plans, and elevations. The drawings must be in 8-1/2 by 11-inch format. Foldouts are acceptable if the vertical dimension is kept to 11 inches. On the drawings, particular attention must be paid to illustrate effective land use. Any proposed land-acquisition requirements, including easements, must be indicated on the site plan. Required safety clearance distances, when applicable, must be shown on the site plan.

3.5.5.2 **Real Estate Interest** -- For those projects requiring additional real estate (on- or offsite) or easements, an appendix must be included in the PER and address the following items:

a. A tabulation segregated by type of ownership (i.e., private, State, or public domain) of only the acreage proposed for acquisition plus easements for access and utilities. The tabulation will include the assessed value of land, assessed value of improvements, current appraised value, and the number of owners involved.

b. The extent of any street or road closings and the extent of any road or utility relocations, including a cost estimate for such closings and/or relocations, separate from the land values indicated above.

c. The extent and estimated costs of required additional rights such as mineral rights, timber rights, and easement rights whether outstanding in parties other than the present owners or not, and a statement as to whether title should be taken in fee simple absolute or subject to such rights.

d. A lease-purchase analysis as required by OMB Circular No. A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs, when a decision has been made to lease or purchase (construct) general-purpose real property.

e. Compliance with EO 12372, Intergovernmental Review of Federal Programs or the basis of exception. Completing an Environmental Impact Statement, Finding of No Significant Impact, or Environmental Assessment satisfies this requirement.

3.5.5.3 **Ancillary Investigations** -- Any supplementary investigations or studies used to enhance, develop, or eliminate alternatives, such as soil conditions, environmental studies, marketing strategies, or feasibility studies, must be either attached to or summarized in the appendices.

3.6 Design Milestones

Regardless of the acquisition strategy selected (e.g., design-build or design-bid-build), the FPM shall ensure that all facilities projects are designed to at least the 30 percent stage prior to advertising for construction.

3.6.1 For facilities projects requiring a complete design prior to construction advertisement, the minimum design milestones are 30 percent and 90 percent. In addition to ensuring the design is coordinated with the project stakeholders during design meetings, the FPM shall distribute 30 percent and the 90-percent design documents to the project stakeholders for review. The following minimum elements must be included for these stages:

3.6.1.1 30-**Percent Design Documents** -- Besides the documentation required in paragraph 2.2.4., Facility Project Requirements, this package must include the following:

a. For new construction or an addition to an existing building, a site plan in accordance with the Center Master Plan.

b. A floor plan, building envelope details (e.g., finishes, roofs, walls, and floors), structural systems, mechanical systems, electrical systems, construction phasing plan, draft commissioning plan, and draft activation plan.

c. Design analysis supporting the basis for the design with calculations. The analysis must contain important assumptions, standards, codes, and other constraints used to determine final selections. The package will include section numbers and titles for all specifications planned.

3.6.1.2 **90-Percent Design Documents** -- The design documents submitted for review will be a completely detailed set of technical design contract documents in final form. They will include the following:

a. A complete set of drawings and specifications with sufficient detail for a prudent contractor to complete the work.

b. A final cost estimate in accordance with paragraph 3.5.3, Section III: Engineering, Budget and Other Estimates.

c. A construction schedule with key milestones for long-lead items, phases clearly delineated, and activation.

3.7 Design Reviews

The corresponding Center Mission Support Offices shall review both the 30--- percent and the 90-percent design stages for constructability, environmental compliance, sustainability, safety, security, health, and code compliance.

3.8 Mission-Critical Systems

For mission-critical technical facilities (for definition, see NPR 7120.5, NASA Space Flight Program and Project Management Requirements) specifically developed or significantly modified for space flight systems and associated ground systems, then the FPM shall comply with both NPR 7120.5 and this document. Where compliance to both policies would duplicate an effort (e.g. a project management plan), only one effort incorporating all required elements from both policies is necessary. For complex or mission-critical systems, the FPM must ensure a Failure Mode and Effects Analysis (FMEA) is accomplished in accordance with NASA STD 8719.7, Facility System Safety Guidebook.

3.9 Facility Activation Plan

For new construction and major renovation projects, the FPM shall develop a facility activation plan during the design phase. This plan will outline the process steps and resources necessary for project implementation. The

activation plan must address the following items, as applicable to the specific project:

a. Noncollateral equipment purchase and installation. For noncollateral equipment no longer needed within an existing facility, refer to NPR 4200.1, NASA Equipment Management Procedural Requirements.

b. Subsystem tests (list each, list test limits, and the PT&I technology to be used).

c. Integrated systems test plan and test.

d. Integrated systems safety and occupational health review.

e. Operational readiness review.

f. Facility systems training.

g. Estimated yearly budget for Operations and Maintenance (O&M) for installed systems.

h. O&M instructions; PT&I, and CMMS information; and manuals.

i. Prefinal inspections.

j. Final inspections.

k. Punch list (close out).

l. Facility and systems as-builts.

m. Warranty transfer.

n. Final facilities construction contract closeout.

o. Contractor performance records.

p. Data systems design and installation.

q. Systems furniture design, purchase, and installation.

r. Telecommunications equipment installation.

s. Personnel move in.

t. Transfer to customer and O&M organization.

3.9.1 Prior to completion of the final design work, the office exercising project approval authority shall review and approve the activation plan.

3.10 Activation Budget

The FPM shall complete the activation budget started in the planning process (see paragraph 2.2.6, Activation Budget Formulation) and submit it during the normal budget process through the Center OCFO. The activation budget includes estimated costs associated with all tasks necessary to verify that the facility meets the project requirements, the systems operate within the design parameters, and the facility and operating organization are ready to use and maintain the facility. The budget includes all costs necessary to outfit the facility for personnel move in and its intended operation (i.e., installation of ground support equipment, integration and checkout of combined facility and noncollateral equipment systems, installation of computer data wiring and systems, installation of systems furniture, and installation of telephone systems). The FPM will include the activation estimate on NASA Form 1509. For discrete projects, the Long Form Writeup also includes the activation costs and scope.

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